

WHAT IS CLAIMED IS:

1 1.An electrostatic discharge protection circuit with high
2 trigger current, coupled to a node and a reference
3 potential for dissipating the electrostatic voltage
4 formed at said node, said electrostatic discharge
5 protection circuit comprising:

6 a substrate having a first conductivity type, coupled to
7 said reference potential;

8 a well region having a second conductivity type, formed on
9 said substrate and coupled to said node;

10 a first doping region having said first conductivity type,
11 electrically floated on said well region; and

12 a second doping region having said second conductivity
13 type, disposed on said substrate and electrically coupled
14 to said reference potential;

15 wherein, the electrostatic discharge current of said node
16 provides a voltage with sufficient magnitude to breakdown
17 the conjunction interface between said well region and said
18 substrate, also triggering a BIPOLAR JUNCTION
19 TRANSISTOR(BJT) comprising said well region, said substrate
20 and said second doping region, for dissipating said
21 electrostatic discharge current;

22 and wherein said first doping area, when the electrostatic
23 discharge current is greater than a predetermined current,
24 reduces the potential difference between said node and said
25 reference potential

1 2.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said electrostatic discharge protection
3 circuit further comprises a third doping area having said
4 second conductivity type, disposed in said well region,
5 electrically coupled to said node, for forming an ohmic
6 connection at said well region.

1 3.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said electrostatic discharge protection
3 circuit further comprises a forth doping region having said
4 first conductivity type, disposed at the surface of said
5 substrate near said well region, electrically coupled to
6 said reference potential, for forming an ohmic connection
7 at said substrate.

1 4.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said first conductivity is p-type, and
3 said second conductivity is n-type.

1 5.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said electrostatic discharge circuit
3 further comprises a fifth conductivity type having said
4 second conductivity type, disposed at the conjunction of
5 said well region and said substrate, for reducing the
6 breakdown voltage at the conjunction of said well region
7 and said substrate.

1 6.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said electrostatic discharge protection
3 circuit further comprises a field oxide layer, disposed at
4 the surface of said substrate adjacent to said fifth doping
5 region.

1 7.The electrostatic discharge protection circuit as claimed
2 in claim 1, wherein said electrostatic discharge protection
3 circuit further comprises a MOS resistor having a first
4 conductivity type disposed on said substrate and comprising
5 a gate and two source/drain regions, wherein one of said
6 source/drain regions is electrically coupled to said well
7 region, while the other of said source/drain regions,
8 together with said gate, is electrically coupled to said
9 reference potential.

1 8.The electrostatic discharge protection circuit as claimed
2 in claim 4, wherein one of said drain/source regions of
3 said MOS resistor having said first conductivity type is
4 comprised of said fifth doping region, and the other of
5 said drain/source regions of said MOS resistor having said
6 first conductivity type is comprised of said second doping
7 region.

8 9.The electrostatic discharge protection circuit as claimed
9 in claim 7, wherein one of said drain/source regions of
10 said MOS resistor having said first conductivity type is
11 comprised of said fifth doping region, and the other of
12 said drain/source regions of said MOS resistor having said
13 first conductivity type is comprised of said second doping
14 region.

1 10.The electrostatic discharge protection circuit as
2 claimed in claim 1, wherein said electrostatic discharge
3 protection circuit further comprises:

4 a MOS resistor having said first conductivity type, formed
5 on said substrate, comprising a gate, and two source/drain
6 regions, wherein one source/drain region is electrically

7 coupled to said well region, and the other source/drain
8 region is electrically coupled to said reference potential;

9 a resistor, its two ends electrically coupled to said gate
10 and said reference potential, respectively; and

11 a capacitor, its two ends electrically coupled to said gate
12 and said node, respectively.

1 11.An electrostatic discharge protection circuit with high
2 trigger current, coupled to a node and a reference
3 potential, for dissipating the electrostatic discharge
4 current from said node, comprising:

5 a BJT, comprising an emitter, a base and a collector,
6 wherein said emitter and said base are electrically coupled
7 to said reference potential, said collector is comprised of
8 a collector region with a second conductivity type and
9 electrically coupled to said node; and

10 a first doping region having a first conductivity type,
11 floated in said collector region, and forms a conjunction
12 interface with said collector region;

13 wherein said first doping region, when said electrostatic
14 discharge current is greater than a predetermined current,
15 reduces the potential difference between said node and said
16 reference potential.

1 12.The electrostatic discharge protection circuit as
2 claimed in claim 11, wherein said electrostatic discharge
3 protection circuit further comprises a MOS resistor having
4 a first conductivity type, disposed on said substrate,
5 comprising a gate, and two source/drain regions, wherein
6 one of said source/drain regions is electrically coupled to

7 said collector, while the other source/drain region,
8 together with said gate, is electrically coupled to said
9 reference potential.

1 13.The electrostatic discharge protection circuit as
2 claimed in claim 11, wherein said electrostatic discharge
3 protection circuit further comprises:

4 a MOS resistor having said first conductivity type,
5 comprising a gate, and two source/drain regions, wherein,
6 one source/drain regions is electrically coupled to said
7 node, and the other source/drain is electrically coupled to
8 said reference potential;

9 a resistor, its two ends electrically coupled to said gate
10 and said reference potential, respectively; and

11 a capacitor, its two ends electrically coupled to said gate
12 and said node, respectively.

13 14. The electrostatic discharge protection circuit as
14 claimed in claim 11, wherein said first conductivity is p-
15 type, and said second conductivity is n-type.

16 15. The electrostatic discharge protection circuit as
17 claimed in claim 1, wherein said first conductivity is n-
18 type, and said second conductivity is p-type.

19 16. The electrostatic discharge protection circuit as
20 claimed in claim 10, wherein said first conductivity is n-
21 type, and said second conductivity is p-type.

22 17. An electrostatic discharge protection circuit with high
23 trigger current, electrically coupled to a node and a
24 reference potential for dissipating the electrostatic

voltage formed at said node, said electrostatic discharge protection circuit comprising:

a base having a first conductivity type, electrically coupled to said reference potential;

a well region having a second conductivity type, formed on said substrate and electrically coupled to said node;

a first doping region having said first conductivity type, electrically floated on said well region and electrically coupled to said node; and

a second doping region having said second conductivity type, electrically floated on said base;

wherein the electrostatic discharge current of said node provides a voltage with sufficient magnitude to breakdown the junction interface between said well region and said base, also triggering a BJT comprising said well region, said base and said first doping region, for dissipating said electrostatic discharge current;

and wherein said second doping area, when the electrostatic discharge current is greater than a predetermined current, reduces the potential difference between said node and said reference potential

18.The electrostatic discharge protection circuit as claimed in claim 17, wherein said electrostatic discharge protection circuit further comprises a third doping area having said second conductivity type, disposed in said well region, electrically coupled to said node, for forming an ohmic connection at said well region.

1 19.The electrostatic discharge protection circuit as
2 claimed in claim 17, wherein said electrostatic discharge
3 protection circuit further comprises a forth doping region
4 having said first conductivity type, disposed at the
5 surface of said base near said well region, electrically
6 coupled to said reference potential, for forming an ohmic
7 connection at said base.

1 20.The electrostatic discharge protection circuit as
2 claimed in claim 17, wherein said electrostatic discharge
3 circuit further comprises a fifth conductivity type having
4 said second conductivity type, disposed at the conjunction
5 of said well region and said base, for reducing the
6 breakdown voltage at the conjunction of said well region
7 and said base.

1 21.The electrostatic discharge protection circuit as
2 claimed in claim 1, wherein said electrostatic discharge
3 protection circuit further comprises a field oxide layer,
4 disposed at the surface of said base adjacent to said fifth
5 doping region.

1 22.The electrostatic discharge protection circuit as
2 claimed in claim 1, wherein said electrostatic discharge
3 protection circuit further comprises a MOS resistor having
4 a first conductivity type, disposed on said base,
5 comprising a gate, and two source/drain regions, wherein,
6 one of said source/drain regions is coupled to said well
7 region, while the other source/drain region, together with
8 said gate, is coupled to said reference potential.

1 23.The electrostatic discharge protection circuit as
2 claimed in claim 20, wherein, one of said drain/source
3 regions of said MOS resistor having said first conductivity

4 type is comprised of said fifth doping region, and the
5 other drain/source regions of said MOS resistor having said
6 first conductivity type is comprised of said second doping
7 region.

8 24.The electrostatic discharge protection circuit as
9 claimed in claim 22, wherein, one of said drain/source
10 regions of said MOS resistor having said first conductivity
11 type is comprised of said fifth doping region, and the
12 other drain/source regions of said MOS resistor having said
13 first conductivity type is comprised of said second doping
14 region.

15 25.The electrostatic discharge protection circuit as
16 claimed in claim 1, wherein said electrostatic discharge
17 protection circuit further comprises:

18 a MOS resistor having said first conductivity type, formed
19 on said base, and comprising a gate and two source/drain
20 regions, wherein one source/drain region is coupled to said
21 well region, and the other source/drain region is coupled
22 to said reference potential;

23 a resistor, its two ends coupled to said gate and said
24 reference potential, respectively; and

25 a capacitor, its two ends coupled to said gate and said
26 node, respectively.

27 26.The electrostatic discharge protection circuit as
28 claimed in claim 17, wherein said electrostatic discharge
29 circuit further comprises a sixth conductivity type having
30 said first conductivity type, disposed at the conjunction
31 of said well region and said base, for reducing the

breakdown voltage at the conjunction of said well region
and said base.

27.The electrostatic discharge protection circuit as
claimed in claim 26, wherein said electrostatic discharge
protection circuit further comprises a field oxide layer,
disposed at the surface of said well adjacent to said sixth
doping region.

28.The electrostatic discharge protection circuit as
claimed in claim 27, wherein said electrostatic discharge
protection circuit further comprises a MOS resistor having
a second conductivity type, disposed on said well region,
comprising a gate and two source/drain regions, wherein one
of said source/drain regions is electrically coupled to
said base, while the other source/drain region, together
with said gate, is electrically coupled to said node.

29.The electrostatic discharge protection circuit as
claimed in claim 18, wherein, one of said drain/source of
said MOS resistor having said second conductivity type is
comprised of said sixth doping region, and the other
drain/source of said MOS resistor is comprised of said
third doping region.

30.The electrostatic discharge protection circuit as
claimed in claim 28, wherein, one of said drain/source of
said MOS resistor having said second conductivity type is
comprised of said sixth doping region, and the other
drain/source of said MOS resistor is comprised of said
third doping region.

31.The electrostatic discharge protection circuit as
claimed in claim 26, wherein said electrostatic discharge
protection circuit further comprises:

4 a MOS resistor having said second conductivity type,
5 comprising a gate, and two source/drain regions, wherein,
6 one source/drain region is electrically coupled to said
7 node, and the other source/drain region is electrically
8 coupled to said reference potential;

9 a resistor, its two ends electrically coupled to said gate
10 and said node, respectively; and

11 a capacitor, its two ends electrically coupled to said gate
12 and said reference voltage, respectively.

32.The electrostatic discharge protection circuit as
claimed in claim 17, wherein said first conductivity is p-
type, and said second conductivity is n-type.

33.The electrostatic discharge protection circuit as
claimed in claim 17, wherein said first conductivity is n-
type, and said second conductivity is p-type.

34. An electrostatic discharge protection circuit with high
trigger current, electrically coupled to a node and a
reference potential for dissipating the electrostatic
voltage formed at said node, said electrostatic discharge
protection circuit comprising:

6 a BJT, comprising an emitter, a base and a collector,
7 wherein said emitter and said base are electrically coupled
8 to said node, said collector is comprised of a collector
9 region with a first conductivity type and electrically
10 coupled to said reference potential; and

11 a second doping region having a second conductivity type,
12 floated in said collector region, and forms a conjunction
13 interface with said collector region;

wherein said second doping region, when said electrostatic discharge current is greater than a predetermined current, reduces the potential difference between said node and said reference potential.

35.The electrostatic discharge protection circuit as claimed in claim 34, wherein said electrostatic discharge protection circuit further comprises a MOS resistor having a first conductivity type, comprising a gate, and two source/drain, wherein, one of said source/drain is electrically coupled to said collector, while the other source/drain region, together with said gate are electrically coupled to said reference potential.

36.The electrostatic discharge protection circuit as claimed in claim 34, wherein said electrostatic discharge protection circuit further comprises:

a MOS resistor having said first conductivity type, comprising a gate, and two source/drain , wherein, one source/drain is electrically coupled to said node, and the other source/drain is electrically coupled to said reference potential;

a resistor, its two ends are respectively electrically coupled to said gate and said reference potential; and

a capacitor, its two ends are respectively electrically coupled to said gate and said node.

37. The electrostatic discharge protection circuit as claimed in claim 11, wherein said first conductivity is p-type, and said second conductivity is n-type.